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APPLICANTS: Berard

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FOR: METHOD FOR EXTRACTING NYLON FROM WASTE MATERIALS

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DATE: December 28, 2006

APPEAL BRIEF

Sir:

This Appeal Brief is filed in support of the Notice of Appeal filed on December 28, 2006. The following sections of the Appeal Brief are provided in compliance with 37 C.F.R. § 41.37(c)(1).

TABLE OF CONTENTS

	Page
I. REAL PARTY IN INTEREST	1
II. RELATED APPEALS AND INTERFERENCES	1
III. STATUS OF CLAIMS	1
IV. STATUS OF AMENDMENTS	1
V. SUMMARY OF CLAIMED SUBJECT MATTER.....	1
VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL	4
VII. ARGUMENT	4
VIII. CLAIMS APPENDIX.....	35
IX. EVIDENCE APPENDIX.....	38
X. RELATED PROCEEDINGS APPENDIX	39

I. REAL PARTY IN INTEREST

In compliance with 37 C.F.R. § 41.37(c)(1)(i), Appellant identifies the real party in interest as Interface, Inc., the assignee of the entire right, title, and interest in this application.

II. RELATED APPEALS AND INTERFERENCES

In compliance with 37 C.F.R. § 41.37(c)(1)(ii), Appellant states that a prior Notice of Appeal in this application was filed on October 7, 2005, and a prior Appeal Brief in support of this prior Notice of Appeal was filed on January 9, 2006. Rather than issue an Examiner's Answer in response to this prior Appeal Brief, the Examiner reopened prosecution.

Appellant, Assignee, and Appellant's counsel are unaware of any other prior or pending appeals, interferences, or judicial proceedings relating to this application.

III. STATUS OF CLAIMS

In compliance with 37 C.F.R. § 41.37(c)(1)(iii), Appellant states that claims 1-13 and 15-21, all of the pending claims in this application, stand finally rejected. Each of the rejections of claims 1-13 and 15-21 are on appeal.

IV. STATUS OF AMENDMENTS

In compliance with 37 C.F.R. § 41.37(c)(1)(iv), Appellant states that an amendment was filed subsequent to final rejection on December 4, 2006, and that amendment was entered and considered by the Examiner.

V. SUMMARY OF CLAIMED SUBJECT MATTER

In compliance with 37 C.F.R. § 41.37(c)(1)(v), Appellant provides the following concise explanation of the subject matter defined in each independent claim on appeal.

This application contains three independent claims, claims 1, 17, and 21, each of which is reproduced below:

1. A method for recovering nylon from a nylon-containing material, comprising:

contacting the nylon-containing material with an alkanol-containing solvent at elevated temperature below 155 °C and at a pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature for a dissolution time of 45 minutes or less, thereby dissolving the nylon in the alkanol-containing solvent;

removing the alkanol-containing solvent containing dissolved nylon from any undissolved solids; and

decreasing the temperature of the alkanol-containing solvent containing dissolved nylon to precipitate the dissolved nylon.

Claim 1 is directed to a process for recovering nylon from a material containing it by contacting the material with a particular type of solvent under relatively low temperature and high pressure conditions, for a specified dissolution time, removing the solvent, which now contains the dissolved nylon, from the undissolved material, and cooling the solvent to precipitate the nylon. By using this particular combination of low temperature and high pressure dissolution, it has been found that the dissolved nylon unexpectedly retains much of its original molecular weight, and in fact can have a molecular weight that is improved by comparison to virgin nylon. This results in nylon that can be spun into fiber with good tenacity. As a result, the recycled nylon obtained from Appellant's process has not been downcycled: i.e., nylon that originates as fiber can be recycled for use as fiber. This is a marked improvement over conventional nylon recycling processes.

The invention is described in the specification, *inter alia*, at page 3, line 16 to page 4, line 29. Suitable dissolution temperatures and pressures are described in the specification at page 5, lines 1-15. Contacting times are described in the specification at page 9, lines 1-5.

17. A method for recovering nylon from a nylon-containing material, comprising:

contacting the nylon-containing material with an alkanol-containing solvent at elevated temperature between about 130 °C and about 155 °C, and at a pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature, obtained by either introducing an inert gas into the reactor, increasing the pressure head of the solvent entering the reactor, or both, thereby dissolving the nylon in the alkanol-containing solvent;

removing the alkanol-containing solvent containing dissolved nylon from any undissolved solids; and

decreasing the temperature of the alkanol-containing solvent containing dissolved nylon to precipitate the dissolved nylon.

Claim 17 recites a process similar to that of claim 1, but specifying a lower limit on temperature, and specifying the techniques used to obtain the high pressure dissolution. It is described in the same portions of the specification cited above with respect to claim 1.

21. A method for recovering nylon from a nylon-containing material, comprising:

contacting the nylon-containing material with an alkanol-containing solvent at elevated temperature between about 130 °C and about 155 °C and at a pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature, and between about 250 psig to about 600 psig, for a dissolution time less than 45 minutes and sufficient to dissolve the desired yield of nylon, thereby dissolving the nylon in the alkanol-containing solvent;

removing the alkanol-containing solvent containing dissolved nylon from any undissolved solids; and

decreasing the temperature of the alkanol-containing solvent containing dissolved nylon to precipitate the dissolved nylon.

Claim 21 recites a process similar to that of claims 1 and 17, but recites an additional pressure limitation, namely that the pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent is also within the range of about 250 psig and about 600 psig.

Claim 21 also recites that the dissolution time, in addition to being less than 45 minutes, is sufficient to dissolve the desired yield of nylon.

Support for the pressure range can be found in the specification at page 5, line 17. Support for the dissolution time being the time necessary to dissolve the desired yield of nylon can be found in the specification at page 5, lines 8-11. Support for the remaining claim limitations can be found in the claims as originally filed.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

In compliance with 37 C.F.R. § 41.37(c)(1)(vi), Appellant provides the following statement of grounds of rejection to be reviewed on appeal.

A. The rejection of claims 1-9, 12, 13, 15, 16, and 18-21 under 35 U.S.C. § 112, first paragraph, as lacking adequate written description.

B. The rejection of claims 1-13 and 15-21 under 35 U.S.C. § 112, first paragraph, as lacking an enabling disclosure.

C. The rejection of claims 1-13 and 15-21 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6,036,726 to Yang et al.

VII. ARGUMENT

In compliance with 37 C.F.R. § 41.37(c)(1)(vii), Appellant provides the following arguments on appeal.

A. Claims 1-9, 12, 13, 15, 16, and 18-21 are fully supported by an adequate written description in the application as filed.

At page 2 of the Office action, the Examiner has rejected claims 1-9, 11-13, 15, 16, and 18-20 under 35 U.S.C. § 112, first paragraph, as lacking adequate written description.

Appellant respectfully requests that this rejection be reversed.

1. Claims 1-9, 12-13, 15, and 16

Appellant argues these claims together because they are the only rejected claims for which the issues of whether (a) the temperature range is supported by adequate written description and (b) the dissolution range is supported by adequate written description are the same.

a. The temperature range recited in claim 1 is fully supported by the specification as filed.

Claim 1 recites that the nylon-containing material is contacted with the alkanol-containing solvent at an elevated temperature below 155 °C. The Examiner asserts that this limitation is not supported by adequate written description in the specification. Appellant's specification clearly states that the "use of increased pressure allows operation at temperatures below 160 °C" referring to the dissolution temperature. This is disclosed in the specification at page 5, lines 10-11, and at page 6, lines 27-28.

Inexplicably, the Examiner has taken the position that a claim limitation that recited dissolution temperatures below 160 °C would be supported by adequate written description, but that this somehow refers not to any temperature below 160 °C, but rather to only the range "about 130 °C to about 155 °C." See Office action of April 5, 2006, page 3, lines 17-19. The Examiner provides no basis for this interpretation, and cites no case law supporting the proposition that a broad range should be interpreted as limited to a disclosed narrower or preferred subrange within it. Appellant respectfully submit that this is not the law.

Appellant's specification also discloses dissolution temperatures of 155 °C (specification at page 5, line 8; page 7, Samples 5, 6; page 8, Samples 1A, 1B, 2A, and 2B);

150 °C (specification at page 7, Sample 7); 147 °C (specification at page 9, Sample 3); 145 °C (specification at page 5, line 9 and page 7, Sample 8); 143 °C (specification at page 9, Samples 1, 2); and 130 °C (specification at page 5, line 8). Appellant has therefore disclosed not only the range "below 160 °C," but also a number of different specific temperatures within that range, including 155 °C. In such circumstances, Appellant submits that the "context" referenced by the Examiner at page 2 of the Office action of August 28, 2006 does not serve to overlay an additional limitation that the temperature must be between 130 °C and 155°C, but merely provides additional disclosure that must be considered in applying the test for adequate written description outlined below.

The correct standard for assessing the adequacy of the written description provided by the original disclosure for amended claim language is whether the disclosure as filed reasonably conveys that the inventor had possession of the later claimed subject matter as of the filing date of the application. *See In re Kaslow*, 707 F.2d 1366, 217 USPQ 1089 (Fed. Cir. 1983); *Lanuza v. Fan*, 76 USPQ2d 1559 (Bd. of Pat. App. & Interf. 2005), *available at* 2005 WL 238927. The Examiner appears to instead apply an "*ipsissimus verbis*" standard, requiring that the exact words used in the claim be present (as evidenced by the Examiner's statement that only the range 130 °C to 155 °C is supported by the specification). The Examiner appears to take the position that Appellant must show a separate example, or have a separate disclosure of each temperature less than 155 °C, stating:

Also, temperature of 150 °C, 147 °C, 145 °C, 143 °C and 130 °C do not support the recited below 155 °C which includes 154.5 °C or 152 °C for example.

See Office action of April 5, 2006, page 3, lines 22-24.

Appellant notes that the situation here is analogous to that at issue in *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). In that case, the written description issue was whether, for a process invention, the disclosure in a prior application of a broad range of solids content from 25% to 60%, along with specific embodiments of solids contents of 36% and 50%, would provide adequate written description for a claimed range of 35% to 60%. The court found the disclosed range to be adequate written description for the claimed range. Similarly, *Wertheim* held that an added claim limitation to a particle size of at least 0.25 mm was supported by a specification that described that the particles may, for example be ground to a particle size preferably within the range of 0.25 to 2.0 mm (reversing the Patent and Trademark Office position that only the range 0.25 mm to 2.0 mm was supported). *Wertheim*, 541 F.2d at 264, 191 USPQ at 99. See also *Synthetic Indus. (Tex.), Inc. v. Forta Fibre Inc.*, 590 F.Supp. 1574, 224 USPQ 955, 961 (W.D. Pa. 1984).

In this application, Appellant has clearly disclosed possession of the range "below 160 °C" as of his filing date. The specification is unambiguous about this. The specification is also unambiguous that 155°C is an alternative upper limit for the dissolution temperature range. As in *Wertheim*, the disclosure of a possible lower limit that provides a narrower range does not function to negate the support in Appellant's specification for the range "below 160 °C," including the range "below 155 °C." To the contrary, the disclosure of specific dissolution temperatures below 155 °C, coupled with the disclosure of a dissolution range "below 160 °C," would lead those skilled in the art to conclude that the range of dissolution temperatures "below 155 °C" was a part of Appellant's invention, and in Appellant's possession as of the filing date of this application. As in *Wertheim*, the

Examiner has “done nothing more than to argue lack of literal support, which is not enough.” *Wertheim*, 541 F.2d at 264, 191 USPQ at 98. Because the Examiner has failed to establish that the claims lack adequate written description in the specification, the Examiner’s rejection of claims 1-9, 15, and 16 on this basis is erroneous and should be reversed.

Although these arguments were presented in Appellant’s earlier Appeal Brief, the Examiner has failed to address them until the August 28, 2006 Office action, in response to a direct request from Appellant that the Examiner either explain why the *Wertheim* and *Synthetic Industries* cases are inapplicable, or follow the dictates of the law embodied in them and withdraw his rejection. The Examiner stated:

With respect to the cited case laws, case law itself is dependent on the merit of each case, and the examiner does not have to apply said case laws to instant invention. Also, the examiner believes that the particle size of *Wertheim* is less critical than the instant temperature and duration of time.

Office action of August 28, 2006, page 3, lines 1-4. While the Examiner’s reasoning is difficult to understand, he seems to be saying that he declines to apply the rationales in *Wertheim* and *Synthetic Industries* to the present application because the facts there were different from the facts here.

However, the facts in almost every patent case differ at least somewhat, and the Examiner has failed to contradict, or even really address, Appellant’s contention that the facts presented herein are directly analogous to those of *Wertheim*, except to point out his subjective conclusion that the particle size in *Wertheim* was “less critical,” whatever that means. Apparently, the Examiner is arguing for a test for written description that requires *ipsissimus verbis* support for claim language if the Examiner decides that the particular claim

language is sufficiently "critical." The Examiner has not provided, nor is Appellant aware of, any case citation that supports such a test. To the contrary, the absence of any mention of a threshold level of "criticality" of the limitation for which support is sought in either *Wertheim* or *Synthetic Industries* strongly suggests that the Examiner's proposed test is not the law. *In re Eickmeyer*, 602 F.2d 974, 202 USPQ 655, 662-663 (CCPA 1979), and discussed below, makes this even more clear.

b. The dissolution time range recited in claim 1 is fully supported by the specification as filed.

Again, the relevant issue is whether the disclosure describes the range of dissolution times sufficiently clearly that one having skill in the art would recognize from the disclosure that Appellant invented the claimed range. The specification discloses a maximum dissolution time of 45 minutes, and exemplifies four additional dissolution times that are less than 45 minutes.

The situation presented by the present facts is analogous to that presented in *In re Eickmeyer*, 602 F.2d 974, 202 USPQ 655, 662 (CCPA 1979). In that case, the appellant was claiming a process involving a step of contacting "at an elevated temperature of at least about 56 ° C." *Eickmeyer*, 602 F.2d at 975, 202 USPQ at 658. The appellant's specification contained "replicate tests of the operation of his process at 56 ° C" and also at 80 °C. *Eickmeyer*, 602 F.2d at 981, 202 USPQ at 662. The court found that it would have been clear to one skilled in the art that appellant considered his hot system to operate at temperatures of at least about 56 °C. In holding that rejections for insufficient written

description were erroneous, and that the above-quoted claim language was supported by the specification, the court stated:

Although appellant may be entitled to claim a range of temperatures below 56 ° C, he need not claim all that he is entitled to claim and need have support only for what he does claim. We are not persuaded that there is any requirement for appellant to demonstrate the Criticality of a lower limit to meet the description requirement.

Eickmeyer, 602 F.2d at 981, 202 USPQ at 662-663.

In this case, Appellant has disclosed a dissolution time of 45 minutes. He has also disclosed several dissolution times less than this time. Under the rationale of *Eickmeyer*, it would have been clear to one skilled in the art that Appellant considered his process to operate at dissolution times less than 45 minutes. Appellant is not required to show any criticality for this upper limit, but is merely required to establish its presence in the specification.

For at least the reasons given above, the rejection made by the Examiner that claims 1-9, 15, and 16 are not supported by adequate written description is erroneous and should be reversed. Again, these issues were raised by Appellant in the first Appeal Brief, but have not been addressed by the Examiner in the Office action. Appellant requested that the Examiner either explain why the *Eickmeyer* case is not applicable, or follow its dictates and withdraw this rejection. Moreover, the Examiner has not explained, using either facts within his own knowledge and supported by a declaration under 37 C.F.R. § 1.104(d)(2), or citing a reference teaching, or even a scientific theory, why it is that any of the time periods encompassed by Appellant's claims will not work. To the contrary, the Examiner's rejection contradicts his later, facile conclusion that:

Even the use of a pressure vessel in order to shorten (cooking) time is well known to person without a knowledge of chemistry such as cooks and house wives, and a pressure cooker (vessel) found in kitchen of a home yields a faster cooking than a regular cooker or pot.

See Office action of April 6, 2006, page 7, lines 4-7.

2. Claim 18

Appellant argues claim 18 separately because it recites an upper limit on dissolution time (37 minutes) that is different from that of claim 1 (45 minutes). As explained in *Eickmeyer*, it is not required that Appellant claim the full range of dissolution times to which he is entitled, or to demonstrate any criticality for the claimed upper limit should he choose not to do so. In this case, Appellant has chosen to claim the range of dissolution times below 37 minutes, which is clearly supported in the specification at page 9, Run 1. For this reason, the Examiner's rejection of claim 18 for inadequate written description is erroneous and should be reversed.

The issue of whether the limitation on temperature is supported by adequate written description is addressed above with respect to claims 1-9, 15, and 16.

3. Claim 19

Appellant argues claim 19 separately because it recites an upper limit on dissolution time (23 minutes) that is different from that of claim 1 (45 minutes) or claim 18 (37 minutes). As with claim 18, it is not required that Appellant claim the full range of dissolution times to which he is entitled, or to demonstrate any criticality for the claimed upper limit should he choose not to do so. In this case, Appellant has chosen to claim the range of dissolution times below 23 minutes, which is clearly supported in the specification at page 9, Runs 2 and

3. For this reason, the Examiner's rejection of claim 19 for inadequate written description is erroneous and should be reversed.

The issue of whether the limitation on temperature is supported by adequate written description is addressed above with respect to claims 1-9, 15, and 16.

4. Claim 20

Appellant argues claim 20 separately because it recites an upper limit on dissolution time (15 minutes) that is different from that of claim 1 (45 minutes), claim 18 (37 minutes), or claim 19 (23 minutes). As with claims 18 and 19, it is not required that Appellant claim the full range of dissolution times to which he is entitled, or to demonstrate any criticality for the claimed upper limit should he choose not to do so. In this case, Appellant has chosen to claim the range of dissolution times below 15 minutes, which is clearly supported in the specification at page 9, Run 4. For this reason, the Examiner's rejection of claim 20 for inadequate written description is erroneous and should be reversed.

The issue of whether the limitation on temperature is supported by adequate written description is addressed above with respect to claims 1-9, 15, and 16.

5. Claim 21

Appellant argues claim 21 separately because it recites lower limits on temperature and recites an upper limit on the dissolution time (45 minutes) that the Examiner agrees is supported by an adequate written description. Claim 21 also recites that the dissolution time is sufficient to dissolve the desired yield of nylon, and is therefore not subject to the erroneous rejections made with respect to claims 1-9, 12, 13, 15, 16, and 18-20. Support for

the dissolution time being the time necessary to dissolve the desired yield of nylon can be found in the specification at page 5, lines 8-11.

B. Claims 1-13 and 15-21 are supported by an enabling disclosure

At pages 3-4 of the Office action, the Examiner has rejected claims 1-13 and 15-21 under 35 U.S.C. § 112, first paragraph, as being beyond the scope of the enablement provided by the specification. Appellant respectfully requests that this rejection be reversed.

As an initial matter, Appellant notes that the Examiner has not repeated his rejection on the basis that the solvent compositions encompassed by the claims are not enabled by the specification, and confines his comments to dissolution time. Accordingly, Appellant assumes that the enablement rejection on the basis of solvent compositions is withdrawn.

1. Claims 1-13 and 15-20

The Examiner asserts that:

the specification, while being enabling for the dissolution temperature [sic, time] of 45, 37, 23, and 15 minutes, does not reasonably provide enablement for the dissolution temperature [sic, time] of 45, 37, 23 and 15 minutes or less. . . . As discussed above, the recited 15 minutes or less encompasses 30 seconds for example, and applicant failed to show that said 30 seconds enable the invention.

See Office action of April 5, 2006 at page 4, lines 11-17.

In making a rejection for lack of enablement, the burden is on the Examiner to establish, either through evidence or scientific reasoning, that the dissolution cannot be carried out in time periods below 15 minutes. See *In re Marzocchi*, 439 F.2d 220, 169 USPQ 367 (CCPA 1971); *In re Dinh-Nguyen*, 492 F.2d 856, 181 USPQ 46 (CCPA 1974). The Examiner has completely failed to do this: the sum total of his reasoning seems to be that

there is not an example or specific disclosure for every possible dissolution time within the range claimed by Appellant. Moreover, even if the claims can arguably be construed to read on some inoperative embodiment (for example, by selecting a dissolution time of a picosecond), this does not mean that the claims are not enabled for the full range of dissolution times claimed. *See In re Cook*, 439 F.2d 730, 169 USPQ 298 (CCPA 1971).

The specification clearly indicates to one of skill in the art that the Appellant had possession of the range of dissolution times recited in the claims for the reasons set forth above with respect to the Examiner's written description rejection. *Marzocchi* and *Dinh-Nguyen* obligate the Examiner to accept that these dissolution time ranges will work unless he has some reason to doubt them based in fact or scientific reasoning. The Examiner neither provides a reference nor a declaration under 37 C.F.R. § 104(d)(2) establishing or even suggesting that the process will not operate at the shorter dissolution times. Instead, the Examiner alleges that Appellant has not enabled carrying out the process at short dissolution times that are so short that they are commercially infeasible (e.g., 30 seconds).

In fact, the dissolution time can be widely varied by one having ordinary skill in this art, without the need for routine experimentation. The important feature of the claimed invention is that the dissolution pressure is maintained at a sufficiently high level (above the equilibrium vapor pressure of the solvent at the dissolution temperature) that the dissolution can be conducted at low temperature, without loss of fiber properties, at relatively short dissolution times. It is thus not necessary for Appellant to provide the Examiner with an example to each and every possible dissolution time (including those that are obviously commercially not feasible) to satisfy his idiosyncratic concerns about enablement. It is

precisely this kind of burdensome requirement that the courts have held improper in cases such as *Marzocchi* and *Dinh-Nguyen*, cited above, as well as in cases such as *In re Armbruster*, 512 F.2d 676, 185 USPQ 152 (CCPA 1975); *In re Bowen*, 492 F.2d 859, 181 USPQ 48 (CCPA 1974); *In re Robins*, 429 F.2d 452, 166 USPQ 552 (CCPA 1970); and *In re Strahilevitz*, 668 F.2d 1229, 212 USPQ 561 (CCPA 1982), among many others that could be cited here.

Moreover, even if the Examiner were able to persuasively argue that a particular, arbitrarily short, dissolution time did not work, this does not mean that the claims are not enabled. It is not a function of the claims to exclude every possible inoperative embodiment. See *In re Cook*, 439 F.2d 730, 169 USPQ 298 (CCPA 1971); *In re Smythe*, 480 F.2d 1376, 178 USPQ 279 (CCPA 1973). Moreover, that Appellant's process would not operate at ridiculously short dissolution times would be apparent to one skilled in this art. Claims to processes that do not recite any reaction times are routinely allowed by the U.S. Patent and Trademark Office without requiring the applicants to recite a reaction time range. Yang et al., relied upon by the Examiner under 35 U.S.C. § 103(a) is one example of this. Appellant should not be penalized and held to a higher standard merely because he places upper bounds (each of which is disclosed in the specification) on the dissolution time of his claimed process.

2. Claim 21

The arguments presented above are particularly true for claim 21, which recites that the dissolution time is sufficient to dissolve the desired yield of nylon. Appellant's specification clearly explains how to do this for a variety of temperatures, pressures and

dissolution times, and one of skill in the art, upon reading about the relationship between pressure, temperature, and dissolution time described at page 5, lines 22-28, would understand how to vary the dissolution time for a given yield by selection of temperature and pressure within the recited ranges. Even more so than for the other claims, the Examiner's implicit speculation that the claimed process will not operate in the recited dissolution time ranges is unsupported for claim 21, which recites that the dissolution time must not only be less than 45 minutes, but also sufficient to dissolve the desired yield of nylon. Claim 21, in other words, makes explicit the requirement of operability that is implicit in the other claims, but which the Examiner has chosen to ignore.

Appellant respectfully submits that the Examiner's allegations that the specification is not enabling for the recited ranges of dissolution times is incorrect as a matter of fact and as a matter of law, and as a result, the Examiner's rejection should be reversed.

C. Claims 1-13 and 15-21 are not obvious over U.S. Patent No. 6,036,726

At pages 4-6 of the Office action, the Examiner has rejected claims 1-13 and 15-21 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6,036,726 to Yang et al.

Appellants respectfully request that this rejection be reversed. Claims 1-3, 5-12, 15, and 16 are argued together below. Claims 4, 13, 17, 18-20, and 21 are argued separately below.

1. There is no *prima facie* case of obviousness of claims 1-3, 5-12, 15 and 16.

Appellant respectfully submits that the Examiner has taken isolated teachings from different parts of Yang et al., combined them together without any motivation to do so, and used hindsight to reconstruct Appellant's discover from this combination. Moreover, the

Examiner has failed to give adequate weight to evidence of unexpectedly superior results provided by Appellant.

Appellant has found that by increasing the dissolution pressure in a process for recovering nylon from waste materials via alkanol-solvent extraction, three effects can be obtained. First, the dissolution can be carried out at lower temperatures than has been previously suggested. Carrying out the dissolution at temperatures below 160 °C makes the process economics much more favorable, as less energy must be consumed in heating the material during the dissolution process, leading to decreased energy costs.

Second, the dissolution time can be greatly reduced to times well below 45 minutes, while providing excellent yield of recovered nylon. Again, these short dissolution times provide a considerable improvement in process economics. Because the dissolution time is so short, more material can be processed through a recovery facility, generating a higher return on capital investment.

Third, because the dissolution and recovery of the nylon results in decreased degradation of its molecular weight (and/or because lower molecular weight nylon components remain in solution after the higher molecular weight materials have precipitated from the process), the nylons produced according to Appellant's process possess tenacities that are as good as, or better than, those obtainable with virgin nylon. This allows the recovered nylon to be used as feedstock in processes for spinning fiber, rather than in lower valued uses, such as injection molding and the like. This maintenance and/or improvement in properties also has a positive effect on process economics, since the recovered nylon can be sold at the higher prices supported by demand in the fiber industry. In addition, the

maintenance/improvement of properties prevents the recovered material from being “downcycled,” in a downward spiral of less valuable uses, until eventually becoming landfill. The recovery process disclosed and claimed by Appellant allows recovered nylon to form part of a sustainable cycle of reuse, and has the potential to significantly decrease demand for virgin nylon (as well as the fossil fuel resources needed to produce virgin nylon).

Neither the combination of operating parameters disclosed and claimed by Appellant, nor the resulting benefits described herein, have been taught or suggested by Yang et al. or by any of the other references that have been cited during the prosecution of this application. Accordingly, a worker having ordinary skill in this art would not have been motivated to modify the teachings of Yang et al. to combine a dissolution pressure greater than the equilibrium vapor pressure provided by the dissolution solvent at the dissolution temperature with a decreased dissolution temperature, with a reasonable expectation of achieving a dissolution time shorter than 45 minutes. Further, such a worker would not have expected that the recycled nylon resulting from that process would have properties as good as those of virgin nylon, and suitable for respinning into nylon fiber.

Yang et al. disclose a method for decolorizing a solid polyamide by (a) contacting it with an organic solvent composition at a temperature effective to dissolve the polyamide, forming a solution of the colorant and the dissolved polyamide, and (b) separating the colorant from the polyamide. See Yang et al., col. 2, lines 6-13. The dissolution temperature is broadly disclosed to be between 140 °C and 220 °C, “preferably about 160 °C – 180 °C.” Yang et al., col. 2, lines 35-38.

However, Yang et al. do not disclose using a pressure that is above the equilibrium vapor pressure of the solvent at the dissolution temperature. The Examiner states that Yang et al. disclose a dissolution pressure of 250 psig, giving the erroneous impression that the same pressure is used for every temperature in the recited temperature range. This is not the case, however. Yang et al. disclose a very broad pressure range "between about atmospheric and about 300 psig, preferably between about atmospheric pressure and 250 psig." Yang et al., col. 7, lines 2-4. The reason such a broad range is necessary is that Yang et al. disclose a wide variety of different dissolution solvents and a wide range of dissolution temperatures, rather than that Yang et al. contains any suggestion that a dissolution pressure above the equilibrium vapor pressure of the solvent at that temperature should be used. To the contrary, Yang et al. explicitly state:

The pressure at which the solvating step is carried out will depend upon the solvent since the pressure is the result of the solvent vapor pressure.

Yang et al., col. 6, lines 56-58 (emphasis added).

Yang et al. make brief mention that "[e]levated pressure may be that provided by an inert gas, such as nitrogen or argon, or it may be vapor pressure generated by vaporization of dissolution liquids (i.e., solvent vapor pressure). See Yang et al., col. 7, lines 4-8. However, there is no explanation in Yang et al. as to how or why this could or should be done. To the contrary, this portion of Yang et al. makes clear that the preference is for higher dissolution temperatures (160-180 °C) combined with lower pressures (atmospheric to 250 psig). Yang et al. are indifferent as to whether pressures above atmospheric are obtained by inert gas

pressurization or “the pressure generated by the vaporization of the liquids in the solvating composition in a pressure vessel.” Yang et al., col. 7, lines 6-8.

Yang et al. certainly does not disclose that an inert gas should be used to increase the dissolution pressure above the vapor pressure of the solvent system, that this should be combined with a lowering of the dissolution temperature to below 155 °C, and that doing so would continue to allow the use of short dissolution times. To the contrary, the specific disclosures of Yang et al. clearly suggest using higher dissolution temperatures around or above 160 °C. Yang et al. specifically disclose dissolution temperatures of 170 °C (col. 7, lines 18-19), 160 °C (col. 9, lines 22-23; col. 10, lines 5-6; col. 10, lines 34-35), 159 – 171 °C (col. 11, line 1; col. 11, line 62), 160 – 180 °C (col. 13, lines 10-56). The only example in Yang et al. that discloses a dissolution temperature range anywhere close to Appellant’s is Example 10, which does not use external pressurization, uses the equilibrium vapor pressure of the solvent system to pressurize the autoclave, and uses a dissolution time greater than 45 minutes.

The Examiner makes much in the disclosure of Yang et al. of the use of a pressure vessel, stating that:

It is well known in chemistry that a higher pressure would yield a faster dissolution of a polymer such as nylon in a solvent, and that a pressure vessel found in a laboratory or plant inherently yields a pressure higher than the equilibrium vapor pressure of a solvent, otherwise it would not be called a pressure vessel.

See the Office of April 5, 2006 action at page 6, line 29 to page 7, line 4. However, it is well known in chemistry that a vessel is called a “pressure vessel” because it is capable of withstanding pressure different from ambient pressure. The term “pressure vessel” does not

indicate that high pressure is necessarily being used in the process, and it says nothing whatsoever about the relationship of the pressure being used to the equilibrium solvent pressure of the material in the vessel. A pressure vessel could just as easily be used to contain material under vacuum, or material at a pressure higher than ambient atmospheric pressure.

The statement in Yang et al. that the vessel used is a "pressure vessel" therefore merely indicates that the dissolution is carried out at a pressure higher than atmospheric pressure; the Examiner has not cited any reference to the contrary, nor has he made his personal knowledge of the Yang et al. process of record in a declaration under 37 C.F.R. § 104(d)(2). Accordingly, no conclusions whatsoever about the relationship between the dissolution pressure and the equilibrium solvent vapor pressure at the dissolution temperature can be drawn from Yang et al.

The Examiner goes on to justify his obviousness rejection over Yang et al. by stating:

Even the use of a pressure vessel in order to shorten (cooking) time is well known to person without a knowledge of chemistry such as cooks and house wives, and a pressure cooker (vessel) found in kitchen of a home yields a faster cooking than a regular cooker or pot.

Office action of April 5, 2006 at page 7, lines 4-7. The Examiner goes on to state:

It is a basic physical chemistry that a polymer would dissolve faster and at lower temperature with increased pressure in a closed vessel, and applicant failed to show otherwise.

Office action of August 28, 2006, at page 5, lines 4-6 (emphasis in original).

Without taking a position on whether it is possible for chemists to also be cooks and house wives, or for cooks and house wives to have studied and understood chemistry, Appellant submits that most cooking involves denaturing of proteins, not dissolution of

nylon from carpet fibers. Pressure cookers work by trapping steam (given off by the food or from added water) in the cooker, increasing the boiling point of the usually liquid material put into the cooker, allowing the food to be heated to higher temperatures without boiling. In other words, at higher temperatures, proteins denature faster. This has nothing to do with dissolution of nylon from carpet fibers, and the Examiner has not shown that increased pressure, as a general proposition, shortens dissolution times and lowers dissolution temperatures. Again, if the Examiner wishes to make the knowledge of cooks and house wives, or of "basic physical chemistry," of record, then he should cite a reference or file a declaration under 37 C.F.R. § 1.107(d)(2). However, as pointed out above, cooking food and dissolving nylon are completely different art areas, and knowledge with regard to one does not automatically apply to the other.

Moreover, Yang et al. certainly did not suggest that an increased pressure and lower dissolution temperature could be used to effectively dissolve nylon; to the contrary, Yang et al. suggest using higher dissolution temperatures than Appellant has claimed, and are indifferent as to increasing pressure above atmospheric. See Yang et al. at column 7, lines 4-8. If increasing pressure and decreasing temperature were a common physical chemistry technique to decrease nylon dissolution time, Yang et al. appear to have been unaware of it. Certainly, there is no mention or suggestion in Yang et al. that a high pressure, low temperature dissolution process would not only decrease dissolution time, but also increase the molecular weight of the nylon produced.

Claim 1 also recites a dissolution time less than 45 minutes. While Yang et al. makes various statements about "controlling" the dissolution time "to ensure the most economic

results” at col. 7, lines 9-21, it does not explain how to achieve the preferred dissolution times of about 0.5 to 30 minutes. The Examiner has already stated on the record that dissolution times as low as 1 minute, which the Examiner does not believe will work. See Office action of August 28, 2006, at page 3. Moreover, Yang et al. exemplifies the use of much longer dissolution times (1 hour) at much higher temperatures (159-171 °C). A reasonable conclusion is that, while Yang et al. appreciated the need for shorter dissolution times because of the economic advantages involved, Yang et al. was unable to achieve these at low temperatures, and clearly did not recognize that low temperatures combined with additional pressurization (i.e., above the equilibrium vapor pressure of the solvent) would provide these short dissolution times at lower temperatures.

The Examiner also states that:

Yang et al. teach that one object of the invention is to avoid any substantial degradation of the polymer during the solvating step at col. 8, lines 54-56 which is the same as that of the instant invention (Field of Invention). Thus, the use a the instant higher pressure in Yang et al. is well warranted.

Office action of April 5, 2006 at page 7, lines 7-10. Appellant submits that the Examiner has applied circular reasoning here. Yang et al. is completely silent as to the combination of high pressure, low temperature and short dissolution time that Appellant is claiming. When Appellant points out that this combination gives excellent retention of polymer molecular weight and actually improves fiber properties, the Examiner turns to the stated goal of Yang et al. and concludes that, since Yang et al. want to avoid degradation, they must have achieved this goal, and since Applicant has shown that he achieved this goal, Yang et al. must use the same conditions identified and claimed by Applicant.

Any polymer recovery process involving dissolution (rather than decomposition and repolymerization) will have as its goal the avoidance of polymer degradation. Not every process achieves this goal. Yang et al. was concerned with decolorization of nylon, not with sustainable recovery of nylon from waste feedstocks. If Yang et al. had discovered that the combination of high dissolution pressure, low dissolution temperature, and short dissolution time achieved its goals, then why did they not specifically disclose that, or even suggest that such a combination could achieve those goals? In fact, Yang et al. did not realize that this particular combination of parameters yielded the polymer properties found by Appellant, and it was not until Appellant's discovery and disclosure of the same that this particular combination of parameters became known. The complete failure of Yang et al. to teach or suggest the claimed combination of parameters, and the failure of the Examiner to suggest a reasonable motivation for one of ordinary skill in the art to adopt the claimed combination constitutes a failure to establish a *prima facie* case of obviousness, and for this reason alone, the Examiner's obviousness rejection should be reversed.

2. Claim 4 is separately patentable over Yang et al.

Claim 4 recites that the alcohol-containing solvent used to dissolve the nylon is substantially free of glycols or other polyols. Yang et al. not only fails to teach such a limitation, but teaches that diols and combinations with diols can be used in the disclosed decolorization process. See Yang et al. at column 2, lines 52-60; at column 6, lines 44-48 and at Example 1. Even assuming, *arguendo*, that the Examiner is correct with respect to the obviousness of claim 1 over Yang et al., there is no teaching or suggestion in Yang et al. to

limit the amount of polyols or glycols in the solvent composition; in fact, Yang et al. teaches the opposite.

A worker of ordinary skill in this art would therefore not have been motivated to exclude glycols or polyols from the solvent mixture used to dissolve nylon, based upon a fair reading of Yang et al. Accordingly, irrespective of whether the Examiner has established a *prima facie* case of obviousness with respect to claim 1, he has not done so with respect to claim 4, and the rejection of this claim should be reversed.

3. Claim 13 is separately patentable over Yang et al.

Claim 13 recites that the dissolution pressure above the equilibrium vapor pressure of the solvent is obtained, at least in part, from the pressure head of the solvent entering the reactor. Nowhere does Yang et al. teach or suggest this. The Examiner apparently disagrees:

Note that there is at least one position for the pressure head on the pressure vessel, and any pressure head of the pressure vessel taught by Yang et al. would at least in part meet the claim 13 since Yang et al. teach the pressure (250 psi) taught by the invention.

Office action of August 28, 2006, page 5, lines 18-20. As explained above, that Yang et al. disclose a range of pressures which may include 250 psig is not a disclosure to use a pressure in the dissolution that is above the equilibrium vapor pressure of the solvent system at the dissolution temperature. Similarly, that a vessel contains a fluid inlet does not establish that there is a pressure head on the fluid in the vessel that is above the equilibrium vapor pressure of the solvent system. Yang et al. does not disclose that the dissolution process is continuous, or provide any indication of a process other than that of an autoclave, i.e., that, carpet and solvent are put in a container, the beaker placed in an autoclave, the autoclave is

closed, the system brought to dissolution temperature, held there for the desired dissolution time, cooled down, and the autoclave opened again, and the container removed. Such an operation would not involve continuous operation, and therefore would inlet or outlet, and therefore would not involve a pressure head. The Examiner's contention that Yang et al. inherently disclose a pressure head to increase pressure in the reactor is therefore incorrect.

A worker of ordinary skill in this art would not have been motivated to use pressure head to increase the dissolution pressure above that of the equilibrium vapor pressure of the solvent. Accordingly, irrespective of whether the Examiner has established a *prima facie* case of obviousness with respect to claim 1, he has failed to do so with respect to claim 13, and the rejection of this claim should be reversed.

4. Claim 17 is separately patentable over Yang et al.

Claim 17 recites a combination of a dissolution temperature range of between about 130 °C and 155 °C, and that the pressure above equilibrium vapor pressure is achieved by inert gas pressurization, increasing the pressure head of solvent entering the reactor, or some combination of these.

Yang et al. does not teach or suggest that inert gas should be used to pressurize the dissolution system above the equilibrium vapor pressure of the solvent, but merely to attain pressure above atmospheric. So, for example, if the entire process were to be conducted at a pressure equal to the vapor pressure of the solvent at the dissolution temperature, and involved heating the material up to the dissolution temperature, an inert gas could be introduced to the autoclave to maintain a constant pressure at that level. This is not the same, as the Examiner appears to assume, as using inert gas to increase the dissolution pressure

above that provided by the solvent at the dissolution temperature. Nowhere does Yang et al. even relate the dissolution pressure to the equilibrium vapor pressure of the solvent at the dissolution temperature, except to indicate that they may be the same, at col. 7, lines 4-8. Nowhere does Yang et al. teach using inert gas to provide a dissolution pressure greater than that which can be provided by the vapor pressure of the solvent. Nowhere does Yang et al. suggest using the pressure head of incoming fluid to pressurize the dissolution process; Yang et al. does not even suggest that the autoclave used in the examples has an inlet that could provide such a pressure head. Nowhere does Yang et al. teach one of ordinary skill in the art that such an increased pressure should be combined with lower dissolution temperature, while at the same time yielding short dissolution times.

Accordingly, irrespective of whether the Examiner has established a *prima facie* case of obviousness with respect to claim 1, he has failed to do so with respect to claim 17, and the rejection of this claim should be reversed.

5. Claims 18-20 are separately patentable over Yang et al.

Claims 18-20 recite dissolution times that are even further removed from those disclosed in Yang et al. As described above, while Yang et al. disclose a range of dissolution times, some of which (according to the Examiner's reasoning with respect to the 35 U.S.C. § 112 rejections) implausibly short, Yang et al. do not explain how to manipulate the dissolution parameters to obtain dissolution times at the short end of the range. To the contrary, in the examples, Yang et al. use dissolution times of around 1 hour, with higher temperatures than are recited in Appellant's claims. A worker of ordinary skill in the art, reading the Yang et al. disclosure, would reasonably expect that shortening the dissolution

times would require even higher dissolution temperatures than those exemplified in Yang et al. They would not have expected that, by increasing the dissolution pressure above the vapor pressure of the solvent, the dissolution temperature could be lowered and decreased dissolution times obtained.

Accordingly, irrespective of whether the Examiner has established a *prima facie* case of obviousness with respect to claim 1, he has failed to do so with respect to claims 18-20, and the rejection of this claim should be reversed.

6. Claim 21 is separately patentable over Yang et al.

Claim 21 recites both the temperature range of about 130 °C to about 155 °C, and that the pressure above the equilibrium vapor pressure of the solvent is also in the range between about 250 psig and about 600 psig, that the dissolution time less than 45 minutes is also sufficient to dissolve the desired yield of nylon. Yang et al. does not suggest the combination of this low temperature range with increased pressure in the recited range provides decreased dissolution time. In the paragraph bridging columns 6 and 7, Yang et al. indicate a preference for higher temperatures (160-180 °C) and low pressures (atmospheric to about 250 psig). Even at these pressures and temperatures, the Examples of Yang et al. make clear that the dissolution time is longer than 45 minutes. Accordingly, irrespective of whether the Examiner has established a *prima facie* case of obviousness with respect to claim 1, he has failed to do so with respect to claim 21, and the rejection of this claim should be reversed.

7. Any *prima facie* case of obviousness is rebutted by evidence of unexpectedly different results.

Even if a *prima facie* case of obviousness could be said to exist, it is rebutted by the evidence of unexpected results presented in the Declaration of Donald Lees. The Lees declaration evaluates the nylon obtained from carrying out the process of Appellant's claims, namely by heating a mixture of ethanol and sheared nylon 6,6 from carpet waste at a temperature between 138 °C and 143°C (below 155 °C) at pressures between 425 psig and 460 psig (above the equilibrium vapor pressure of ethanol at the dissolution temperatures, which is about 113 psig) in a coiled tube heat exchanger for a dissolution time of less than 45 minutes. The resulting solution was strained to remove undissolved solids and flashed in a crystallizer to a temperature of between 115 °C and 125 °C. The resulting nylon was separated, dried, and extruded to form nylon fiber. The tenacity of the resulting fiber was tested, and unexpectedly found to be above that of the tenacity for nylon fiber extruded from virgin (unrecycled) nylon. The resulting fiber was spun into yarn and incorporated into carpet, whose properties were also evaluated. This evaluation indicated that nylon produced according to Appellant's claims was suitable for forming into fiber for use in carpet.

This suitability was unexpected because one of ordinary skill in the art would have expected significant degradation of the molecular weight of the nylon as the result of its prior use, as well as from the dissolution and recovery process. None of the prior art cited by the Examiner in this application teaches or suggests that a dissolution/recycling process can produce nylon with a molecular weight that is at the upper limit of the molecular weight range of virgin nylon (despite any precatory assertions in Yang et al. that deterioration of nylon should be avoided). Appellant submits that this evidence of unexpectedly different result, when considered with the prior art that the Examiner relies upon, constitutes a

“secondary consideration” that leads one of ordinary skill in the art to the conclusion that Appellant’s claimed invention would not have been obvious. *See In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976).

With respect to the Lees declaration, Appellant notes that the advantages shown in the Lees declaration inherently flow from a basic property or utility disclosed in the specification. *See In re Davies*, 475 F.2d 667, 177 USPQ 381, 384-85 (CCPA 1973); *In re Zenitz*, 333 F.2d 924, 142 USPQ 158, 160-61 (CCPA 1964) (Separation of hypotensive and tranquilizing activity and minimized hypotensive activity inherently flowed from disclosure in specification of use of compounds as tranquilizers); *Ex parte Sasajima*, 212 USPQ 103, 104 (Bd. of App. 1980), *available at* 1980 WL 30184 (Undisclosed toxicity advantages inherently flow from disclosure of use as pharmaceutical); *In re Lorenz*, 333 F.2d 908, 142 USPQ 101, 104 (CCPA 1964) (There is no requirement that superiority over prior art be disclosed in the original application; it is enough if the basic property or utility is disclosed).

In this application, the basic utility and properties disclosed in the specification include the use of the recovered nylon as fiber due to its retention of molecular weight, described, *inter alia*, at page 3, lines 20-29. The specification describes that, with respect to nylon recycled from fibers that had been previously used in, e.g., floor coverings, one of ordinary skill in the art would expect that the molecular weight of the recycled nylon to be significantly decreased when compared to virgin nylon. This can occur as the result of a variety of causes, including the original high temperature extrusion process, exposure of the nylon to various environmental conditions, the extraction or dissolution process, and re-extrusion of the recovered nylon into fiber. The cumulative effect of this degradation

generally renders post-consumer recycled nylon unsuitable for use in fiber, and thus results in a downcycling of the nylon. *See* the specification at p. 2, line 20 to p. 3, line 13.

Appellant explains in this portion of the specification that the process of the invention allows the nylon present in floor coverings to be recycled without being downcycled, and that this results from the ability of the claimed process to avoid degrading the molecular weight of the nylon. *See* the specification at p. 3, lines 22-29; p. 5, line 25 to p. 6, line 7; and p. 6, line 27 to p. 7, line 3.

The Lees declaration reports results for testing of tenacity of fiber prepared according to the method claimed by Appellant. Fiber tenacity is strength per unit size of the fiber, and is a property frequently used to evaluate and describe fibers. Those of ordinary skill in the polymer or fiber art know that increasing the strength of a particular type of fiber often requires increasing the molecular orientation of the polymer molecules, and maintaining a high molecular weight of the polymer; short (low molecular weight polymer chains) are less able to orient properly and provide less contribution to the overall strength of the fiber. Tenacity, therefore, provides direct information about the strength properties of the fiber and its ability to perform in a particular application (e.g., as part of a carpet yarn). Tenacity also provides information about the molecular weight of the polymers making up the fiber, as higher molecular weight polymers tend to form fibers having higher tenacities.

Appellant respectfully submits that an improvement in tenacity for fiber produced by the claimed process inherently flows from Appellant's repeated disclosure in the specification that the claimed process is suitable for the recycling of carpet fiber nylon into nylon suitable for re-extrusion into fibers. As a result, the unexpected improvement in

properties has been properly considered by the Examiner in evaluating the propriety of the obviousness rejection.

The Examiner has stated that:

With respect to applicant's argument based on the data of the declaration, the pressure, 426-460 psig used in the test is broader than the actual invention, and thus it has little probative value. Note that the minimum pressure is recited in claims is about 250 psig, not 425-460 psig used in the test. Also, the temperature of 113 °C is not disclosed in the specification and the page 5 teaches "about 130 °C to about 155 °C" as discussed above.

Office action of August 28, 2006, page 6 (emphasis in original).

First, the dissolution pressure used is not broader than that recited in the claims. Claim 1 and claim 17 both recite that the dissolution pressure be above that of the equilibrium vapor pressure of the solvent at the dissolution temperature. As indicated in the Lees declaration, the equilibrium vapor pressure of the solvent used in the experiment reported therein at the dissolution temperature was 113 psig, which is below the 425-460 psig used in the experiment reported in the Lees declaration. Moreover, claim 21 recites a pressure range of 250 psig to 600 psig. The relatively narrow range of pressure used in the experiment in the Lees declaration falls within the scope of the claimed range, not outside of it, as the Examiner has alleged. As explained above, the relatively narrow dissolution temperature range is also well within the scope of the claimed dissolution temperature range (i.e., 138 – 143 °C is below 155 °C). Appellant respectfully submits that the Examiner's dismissal of the Lees declaration as "of little probative value" because the pressure range used in the test is "broader than the actual invention" is erroneous.

To the contrary, Appellant has shown that, by operating within the claimed parameters, he is able to achieve a fiber tenacity higher than most, if not all, available virgin nylon products. The Yang et al. publication discloses that a change of 5% in molecular weight during the dissolution process alone is acceptable. One of ordinary skill in the art would reasonably expect that this 5% degradation, coupled with the degradation that occurs during the initial extrusion and use of the fiber, would result in a recycled nylon tenacity below that of virgin nylon, not at the upper limit of what is found for virgin nylon. It is not necessary that Appellant test every possible temperature, pressure, and dissolution time combination within the scope of the claims, since the specification makes clear that at temperatures below 155 °C and at high dissolution pressures, relative viscosity (an indicator of average molecular weight) increases as compared to higher dissolution temperature, lower dissolution pressure processes. See the specification at page 7, lines 17-29. As a result, the results provided in the Lees declaration can reasonably be extended to show the unobviousness of the broader claimed range of temperatures. See *In re Clemens*, 206 USPQ 289 (CCPA 1980).

Appellant respectfully submits that the declaration of Lees shows that the use of low dissolution temperatures (below 155 °C) combined with high dissolution pressures (above the equilibrium vapor pressure of solvent at the dissolution temperature) for short dissolution times (less than 45 minutes) yields nylon that is not only suitable for extrusion and reuse as nylon fiber, but has a fiber tenacity higher than what would be obtained for most virgin nylon. Nowhere is this suggested in Yang et al. Such a result is completely unexpected, and is strong evidence of the nonobvious nature of the claimed invention. Appellant respectfully

submits that this evidence rebuts any *prima facie* case of obviousness that might be said to exist with respect to the rejected claims. For this reason as well, the Examiner's rejection should be reversed.

CONCLUSION

The Examiner's rejections of the claims for lacking adequate written description, lacking enablement, and obviousness are erroneous for at least the reasons given above, and should be reversed.

VIII. CLAIMS APPENDIX

In compliance with 37 C.F.R. § 41.37(c)(1)(viii), Appellant provides the following appendix containing a copy of the claims involved in this Appeal.

1. A method for recovering nylon from a nylon-containing material, comprising:
contacting the nylon-containing material with an alkanol-containing solvent at elevated temperature below 155 °C and at a pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature for a dissolution time of 45 minutes or less, thereby dissolving the nylon in the alkanol-containing solvent;
removing the alkanol-containing solvent containing dissolved nylon from any undissolved solids; and
decreasing the temperature of the alkanol-containing solvent containing dissolved nylon to precipitate the dissolved nylon.
2. The method of claim 1, wherein the nylon-containing material comprises a floor covering material.
3. The method of claim 1, wherein the nylon is nylon 6,6.
4. The method of claim 1, wherein the alkanol-containing solvent is substantially free of glycols or other polyols.
5. The method of claim 1, wherein the alkanol-containing solvent comprises an alkanol selected from the group consisting of methanol, ethanol, propanols, butanols, and mixtures thereof.
6. The method of claim 1, wherein the alkanol-containing solvent comprises a mixture of alkanol and water.

7. The method of claim 6, wherein the alkanol is present in an amount ranging from about 40 wt% to about 90 wt% of the solvent.
8. The method of claim 7, wherein the alkanol-containing solvent comprises a mixture of about 80 wt% ethanol in water.
9. The method of claim 1, wherein the pressure during the contacting ranges from about 250 psig to about 600 psig.
10. The method of claim 1, wherein the elevated temperature ranges from about 130 °C to 155 °C.
11. The method of claim 10, wherein the elevated temperature is about 145 °C.
12. The method of claim 1, wherein the pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature is attained by introducing an inert gas into the reactor.
13. The method of claim 1, wherein the pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature results at least in part from the pressure head of the alkanol-containing solvent entering the reactor.
15. The method of claim 1, wherein the nylon-containing waste material comprises nylon-containing floor covering materials which comprise carpet or carpet tile, or mixtures thereof.
16. The method of claim 15, wherein the carpet or carpet tile contains nylon 6,6.
17. A method for recovering nylon from a nylon-containing material, comprising:
contacting the nylon-containing material with an alkanol-containing solvent at elevated temperature between about 130 °C and about 155 °C, and at a pressure higher than

the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature, obtained by either introducing an inert gas into the reactor, increasing the pressure head of solvent entering the reactor, or both, thereby dissolving the nylon in the alkanol-containing solvent;

removing the alkanol-containing solvent containing dissolved nylon from any undissolved solids; and

decreasing the temperature of the alkanol-containing solvent containing dissolved nylon to precipitate the dissolved nylon.

18. The method of claim 1, wherein the dissolution time is 37 minutes or less.

19. The method of claim 18, wherein the dissolution time is 23 minutes or less.

20. The method of claim 19, wherein the dissolution time is 15 minutes or less.

21. A method for recovering nylon from a nylon-containing material, comprising:

contacting the nylon-containing material with an alkanol-containing solvent at elevated temperature between about 130 °C and about 155 °C and at a pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature, and between about 250 psig to about 600 psig, for a dissolution time less than 45 minutes and sufficient to dissolve the desired yield of nylon, thereby dissolving the nylon in the alkanol-containing solvent;

removing the alkanol-containing solvent containing dissolved nylon from any undissolved solids; and

decreasing the temperature of the alkanol-containing solvent containing dissolved nylon to precipitate the dissolved nylon.

EVIDENCE APPENDIX

In compliance with 37 C.F.R. § 41.37(c)(1)(ix), Appellant provides the following appendix containing a copy of the evidence relied upon by Appellant this Appeal.

A copy of the declaration of Donald Lees, filed under 37 C.F.R. § 1.132 and entered by the Examiner in the Office action dated April 7, 2005, is attached hereto.

IX. RELATED PROCEEDINGS APPENDIX

In compliance with 37 C.F.R. § 41.37(c)(1)(x), Appellant provides the following appendix containing a copies of decisions rendered by courts or the Board in any proceeding identified by Appellant in accordance with 37 C.F.R. § 41.37(c)(1)(ii).

NONE.

Because a fee was paid with Appellant's previous Appeal Brief, and because prosecution was reopened prior to a decision on the merits by the Board of Patent Appeals, the fee paid with the previous Appeal Brief should be applied to this Appeal Brief. The Commissioner is hereby authorized to charge any deficiencies or credit any overpayment to Deposit Order Account No. 11-0855.

Respectfully submitted,



Bruce D. Gray
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS: Berard

SERIAL NO.: 09/852,855

GROUP ART UNIT: 1714

FILED: May 10, 2001

EXAMINER: Wyrozebski Lee

FOR: METHOD FOR EXTRACTING NYLON FROM WASTE MATERIALS

ATTORNEY DOCKET NO.: I4060/198355

I hereby certify that this correspondence is being deposited with the
United States Postal Service as certified first class mail in an envelope
addressed to: Commissioner of Patents, P. O. Box 1450, Alexandria,
VA 22313-1450, on January 18, 2005

Alexandra Stamatakis

Commissioner for Patents
P. O. Box 1450 Alexandria,
VA 22313-1450

DATE: January 18, 2005

DECLARATION UNDER 37 C.F.R. § 1.132

Sir:

I, Donald Lees, declare as follows:

1. I am currently employed as Senior engineer [insert title] by Interface, Inc., the assignee of the above-mentioned patent application, and have been employed in this capacity for 3 years.
2. Prior to my employment with Interface, Inc., I was employed as an engineer by Lockwood Greene.

3. I have been involved in design, scale-up, and testing of the process described in the above-mentioned patent application for 3 years, first as an engineer at Lockwood Greene and then as an engineer at Interface, Inc.
4. The testing described herein was carried out by me or at my direction.
5. Sheared nylon 6,6 fibers from waste carpet was air elutriated and mixed with an ethanol solvent at a concentration of approximately 2.75 wt%. This mixture was heated to a temperature between about 138 °C and 143 °C at a pressure between about 425 psig and 460 psig in a coiled tube heat exchanger for less than 45 minutes (at a flow rate of between 1.32 gpm and 1.5 gpm). The equilibrium vapor pressure for ethanol at these temperatures is approximately 113 psig. The resulting solution was strained to remove undissolved solids, and flashed into a crystallizer tank at a temperature of about 115 °C to about 125 °C. The precipitated nylon was concentrated, dried and obtained as powdered nylon. In order to efficiently dry the material, nylon obtained from a previous run through the process was backmixed into the concentrated nylon/solvent stream fed to the drier.
6. At my direction, the nylon powder was further dried to a moisture content of 500 ppm, pelletized, and extruded through a filter pack and spinnerette to produce nylon fiber. At my direction, the denier and tenacity of this fiber were tested. The denier was found to be 2429 and the tenacity was surprisingly found to be 3.11 lb. This tenacity is surprisingly good because it is at the upper limit for tenacity specifications for drawn virgin nylon fiber.

7. At my direction, the nylon fiber obtained above was spun into yarn and tufted into Lutradur primary carpet backing having a Glasbac backing, at a face weight of 17 oz/yd².

8. At my direction various tests were performed on the resulting carpet, which are provided in the table below.

TEST	RESULT
Art 5 yr (Dry) Maintenance	8.25
Art 5 yr (Wet) Maintenance	8
Burrough's Resistance	9083 meg
Delamination - Dry	No separation
Fluorine	2322
IBM Resistance	3783 meg
Light Fastness	2-3 (60 AFUs)
Nitrogen Dioxide	4-5 (2 cy.)
Ozone Fading	4-5 (2 cy.)
Radiant Panel	.70
Radiant Panel - 15 min.	.78
Smoke - Flaming	166
Smoke - Flaming - 4 min.	131
Smoke - Non-flaming	438
Smoke - Non-flaming - 4 min.	66
Stain (red dye 40) - 24 hour	10
Tuftbind - Dry	8.66 lb
Vetterman Drum	1.5 @ 22,000 cy.

9. These tests indicate that fiber prepared according to the process claimed in the above-mentioned patent possesses properties making it suitable for use as carpet fiber. This is surprising because it would have been expected that degradation of fiber properties during initial use as carpet face cloth would diminish the utility of the fiber for carpet facecloth.

10. I further declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true, and further that the foregoing statements were made with the knowledge that willful false statements and the like so made are punishable by fine, or imprisonment, or both, under 18 U.S.C. § 1001, and that such willful false statements may jeopardize the validity of the above-referenced application or any patent issuing thereon.

Date: 1/13/05

Signed: Donald W. Lees
Donald Lees